REMARKS

The Examiner is thanked for the performance of a thorough search.

By this amendment, Claims 27, 29, 30, 33, 35-37, 44, 63, 65, 66, 69, 71-73, and 80 have been amended, Claims 20-26 and 56-62 have been cancelled, and no Claims have been added. Hence, Claims 27-52 and 63-88 are pending in the application.

As a preliminary matter, the Applicants acknowledge the Examiner's comments regarding the formal drawings. Applicants herein submit formal drawings believed in compliance with 37 C.F.R. § 1.84.

The Applicants note the copy of the Information Disclosure Statement (PTO 1449) that was filed with the application on January 5, 2001 was returned to the Applicants without the Examiner's initials next to the cited art. A copy of the Information Disclosure Statement as filed accompanies this response for the convenience of the Examiner. The Applicants respectfully request that the cited art on the Information Disclosure Statement be entered into the art of record, and copy of the Information Disclosure Statement with Examiner's initials associated with all art cited therein be transmitted to the Applicants.

SUMMARY OF THE REJECTIONS/OBJECTIONS

The reissue declaration filed with the application is allegedly defective because (a) the error that is relied upon to support the reissue application is not an error upon which a reissue may be based, and (b) the declaration fails to identify at least one error which is relied upon to support the reissue application.

Claims 20-52 and 56-88 were rejected under 35 U.S.C. § 251 as allegedly based upon a defective reissue declaration.

The reissue application was allegedly filed without the required offer to surrender the original patent, or if the original is lost or inaccessible, an affidavit or declaration to that effect.

The Applicants acknowledge the Examiner's comments regarding a discussion of status of the claims in amendments in a reissue application as required by 37 CFR § 1.173 (c).

Claims 23-37 are rejected under 35 U.S.C. § 251 as allegedly being an improper recapture of claimed subject matter deliberately cancelled in the application for the patent upon which the present reissue is based.

The present reissue application is objected to under 37 CFR § 1.172(a) as allegedly lacking the written consent of all assignees owning an undivided interest in the patent.

Claims 20-52 and 56-88 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Hong et al. "Optimization of Parallel Query Execution Plan in XPRS", Proceedings of the First International Conference on Parallel and Distributed Information Systems, IEEE, 1991, pp. 218-225 ("Hong").

The Applicants respectfully traverse the rejections/objections.

RESPONSE TO REJCTIONS/OBJECTIONS NOT BASED ON THE CITED ART

1. Reissue declaration is valid under MPEP § 1414

The Applicants respectfully submit that the reissue declaration filed with the application is valid because both (a) the error that is relied upon to support the reissue application is expressly stated as a valid error to rely upon, and (b) the application expressly identifies at least one error which is relied upon to support the reissue application. In §1414 of the MPEP, it is

stated that a declaration may state "[that the] Applicant believes the original patent to be partially inoperative or invalid by reason of the patentee claiming more or less than patentee had the right to claim in the patent," and that it will be sufficient to satisfy the requirement of identifying an error without further statement. The Applicants respectfully submit that the cited language is present in the reissue declaration. A copy of the reissue declaration as filed evidencing the presence of that statement accompanies this paper for convenience of examination. Accordingly, the Applicants respectfully submit that the error relied upon in the reissue declaration to support the reissue application is an error upon which a reissue may be based. See MPEP § 1414.

Further, the Applicants respectfully submit that at least one error relied upon to support the reissue declaration is cited. Specifically, the reissue declaration identifies the following error that is relied upon to support the reissue declaration:

> "This is a broadening reissue. The error occurred when, during the prosecution of the original patent, the claims were repeatedly amended by inserting into all of the independent claims limitations directed to additional novel features regardless of the novel features that the claims initially recited. Thus, even the broadest claims resulting from this process require a combination of several independently patentable features, even though the patentee is entitled to separate claims to each of the novel features of the invention. This reissue corrects that error. The nature of the broadening is illustrated by comparing the new Claim 20 to the issued Claim 1. The new Claim 20 requires a set of entities to perform an operation in parallel, where at least one of the entities is assigned more than one work partition form the operation ("feature A"). However, in addition to reciting feature A, the

> issued Claim 1 recites other novel features, such as generating a serial executing plan and a parallel execution plan for the same operation, and determining which of the two plans to execute based on the resources available at the time of execution ("feature B"). Thus, Claim 1 is partially inoperative in that it can only be used to prevent the unauthorized use of feature A when that feature is used in combination with feature B. In contrast, new Claim 20 covers feature A without requiring feature B."

Section 1414 of the MPEP states "Applicant need only specify in the reissue oath/declaration one of the errors upon which reissue is based. Where applicant specifies one such error, this requirement of a reissue oath/declaration is satisfied." The Applicants respectfully submit that the identified error is an error upon which reissue may be based in conformance with 37 CFR § 1.175(a)(1) because the patentee claimed more or less than the patentee had the right to claim in the patent. Accordingly, it is respectfully submitted that the reissue declaration is in compliance with 37 CFR § 1.175 and is valid.

2. Rejection of Claims 20-52 and 56-88 under 35 U.S.C. § 251

The Applicants respectfully submit that the rejection of Claims 20-52 and 56-88 under 35 U.S.C. § 251 as allegedly based upon a defective reissue declaration may not be sustained because the reissue declaration is valid under 37 CFR § 1.175. Consequently, the Applicants respectfully request that the rejection of Claims 20-52 and 56-88 under 35 U.S.C. § 251 as allegedly based upon a defective reissue declaration be removed.

3. Offer to Surrender the Original Patent under 37 CFR § 1.178

The Applicants hereby make the offer to surrender the original patent to comply with 37 CFR § 1.178(a) for examination of the reissue application.

4. Support for Claims as Required under 37 CFR § 1.173 (c)

37 CFR § 1.173 (c) requires a status of the claims and a discussion of the support in the disclosure for the claims as required by 37 CFR § 1.173(c). The status of the claims is provided next to each claim in the section entitled "Version With Markings To Show Changes Made To Claims Relative To U.S. Patent No. 5,857,180." Support for each claim may be found in the specification from Col. 2, line 19 – Col. 32, line 48 and Figs. 2-19. Support for elements in each claim is generally not limited to a small portion of the specification, but rather the support may be found throughout the explanation of aspects of the invention. As a result, Applicants have identified portions in the specification where support may be found for each claim, but additional support for each claim may be found elsewhere in the specification.

Support for Claims 27 and 63 may be found in (a) Col. 5, line 22 - Col. 6, line 67 and Col. 8, line 57 - Col. 10, line 22 which describes dividing an operation into a set of work partitions; (b) Col. 7, line 1 to Col. 8, line 35, which describes assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions; and (c) Fig. 8 and Col. 8, lines

55 to Col. 10, lines 23, which describes the plurality of entities operating in parallel on work partitions assigned to them to perform said operation. Fig. 3C also graphically illustrates assigning work partitions to a plurality of entities, wherein the plurality of entities are operating in parallel. Col. 8, lines 21 – 35 describes assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions.

Support for Claims 28 and 64 is similar that discussed above with reference to Claims 27 and 63. Further, Col. 8, lines 21-35 discusses assigning work partitions in a sequence by assigning relatively larger work partitions before assigning relatively smaller work partitions.

Support for Claims 29 and 65 is similar to that discussed above with reference to Claims 27 and 63. Col. 3, line 65 - Col. 4, line 7 and Col. 18, line 34 – Col. 19, line 30 and Fig. 3C describe an operation specified in a query that corresponds to a hierarchy of operations.

Support for Claims 30 and 66 is similar to that discussed above with reference to Claims 27 and 63. Col. 12, line 65 - Col. 15, line 35 provides additional support. For example, Col.15, lines 26-30 states "If parallelism cannot be implemented because of the unavailability of additional query slaves, the parallelizer row source becomes invisible, and the serial row source tree is implemented."

Support for Claims 31 and 67 is similar to that discussed above with reference to Claims 27 and 63. Col. 8, line 57 – Col. 10, line 24 discusses identifying one or more segments in the execution plan that may be parallelized and identifying partitioning requirements for those segments.

Support for Claims 32 and 68 is similar to that discussed above with reference to Claims 27 and 63. Col. 8, line 57 – Col. 10, line 24 discusses generating a parallelized execution plan based on a specification of parallelism in a statement specifying one of said operations.

Support for Claims 33 and 69 is similar to that discussed above with reference to Claims 27 and 63. Col. 8, line 56 – Col 18, line 31 also discusses elements of this claim, e.g., the central scheduler. Col. 8, line 57 – Col. 10, line 24 discusses identifying a parallelized portion of the execution plan where the parallelized portion includes first and second operations executed in parallel. Col. 9, lines 6-8 states the execution plan "is examined, from the bottom up, to determine those portions of the plan that can be parallelized." Col. 12, line 65 – Col. 18, line 32 discusses the central scheduler between the parallelized portion and the serial portion of the execution plan.

Support for Claims 34 and 70 is similar to that discussed above with reference to Claims 33 and 69. Col. 28, lines 44-57 provide support for the Claims 34 and 70.

Support for Claims 35 and 71 is similar to that discussed above with reference to Claims 27 and 63. Col. 12, line 65 – Col. 15, line 21 discusses directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data. Generating an execution plan to execute database operations in parallel is discussed at Col. 8, line 57 – Col. 10, line 22.

Support for Claims 36 and 72 is similar to that discussed above with reference to Claims 27 and 63. Col. 31, lines 10-12 provide support for Claims 36 and 72.

Support for Claims 37 and 73 is similar to that discussed above with reference to Claims 27 and 63. Col. 8, line 57 – Col. 10, line 23 and Col. 18, line 35 – Col. Col. 19, line 30 provide additional support for Claims 37 and 73.

Support for Claims 38 and 74 is similar to that discussed above with reference to Claims 27 and 63. Col. 8, line 57- Col. 10, line 22 provide support for Claims 38 and 74. For example, Col. 9, lines 11 - 13 state "the present invention provides the ability for the SQL statement to specify the use and degree of parallelism." Col. 10, lines 15-17 states the "SQL statement can specify the degree of parallelism to be used for the execution of constituent parts of an SQL statement."

Support for Claims 39 and 75 is similar to that discussed above with reference to Claim 27. Col. 8, line 56 – Col. 10, line 22 discusses a query requiring a plurality of operations and a statement that specifies the degree of parallelism.

Support for Claims 40 and 76 is similar to that discussed above with reference to Claim 27. Col. 8, line 56 – Col. 10, line 22 discusses the degree of parallelism specified by the query indicates that no amount of parallelism is to be used. For example, Col. 10, lines 19-21 states a "SQL statement may indicate that no amount of parallelism is to be used."

Support for Claims 41 and 77 is similar to that discussed above with reference to Claim 38. Col. 8, line 56 – Col. 10, line 22 discusses a maximum amount of parallelism may be specified by the query. For example, Col. 10, lines 21-23 states a "SQL statement may specify the maximum amount of partitioning implemented."

Support for Claims 42 and 78 is similar to that discussed above with reference to Claim 27. Col. 10, lines 15-24 and Col. 11, line-57 – Col. 12, line 39 discusses incorporating hints into at least some of said query fragments.

Support for Claims 43 and 79 is similar to that discussed above with reference to Claim 42. For example, Col. 11, line 62 – Col. 12, line 15 discusses providing hints to the operation of the table scan DFO. The operation of the table scan is dictated by the hint in that example because rowid partitioning was specified.

Support for Claims 44 and 80 is similar to that discussed above with reference to Claim 43.

Support for Claims 45 and 81 is similar to that discussed above with reference to Claim 42. For example, Col. 11, line 62 – Col. 12, line 15 discusses providing hints to the operation of the table scan DFO. An example of a hint that specifies performance of a full table scan is provided at Col. 12, lines 3-4.

Support for Claims 46-48 and 82-84 are similar to that discussed above with reference to Claim 42. For example, Col. 12, lines 4-5 provide examples of hints that specify a particular type of join, a sort/merge join, and a nested loop join.

Support for Claims 49 and 85 may be found at Fig. 3C and Col. 12, line 65 – Col. 15, line 21. Additional support for Claim 49 may be found at Col. 18, line 34 – Col. 19, line 31 and at Col. 12, line 65 – Col. 15, line 35. For example, Fig. 3C illustrates a hierarchy with odd levels (the levels corresponding to Set A and Set C) and with even levels (the level corresponding to Set B), wherein a first plurality of entities (Slave set A) is assigned work partitions from the odd

levels, and a second plurality of entities (Slave set B) is assigned work partitions from the even levels. Further, Fig. 3C illustrates a first set of entities producing output consumed by the second plurality of entities, and the first set of entities consuming output produced by the second plurality of entities.

Support for Claims 50-52 and 86-88 is similar to that discussed above with reference to Claim 49 and 85.

Additional support for all pending claims may be found in the example provided at Col. 20, line 1 – Col. 27, line 45.

Accordingly, the Applicants respectfully submit that amendments to the claims herein are in the proper form under 37 CFR § 1.173 (c).

5. Written Consent of All Assignees is Properly Filed

The Applicants respectfully submit that the present reissue application was filed with the written consent of all assignees owning an undivided interest in the patent. Specifically, form PTO/SB/53 indicating the consent of the assignee was filed with the present reissue application, along with form PTO/SB/96, which is the statement under 37 CFR 3.73(b) indicating the assignee is the assignee of the entire right, title, and interest. For the convenience of examination, copies of forms PTO/SB/53 and PTO/SB/96 as originally filed in the present reissue application accompany this response. The Applicants respectfully submit that the present reissue application is in conformance under 37 CFR § 1.172, and therefore requests the objection

regarding the lacking the written consent of all assignees owning an undivided interest in the patent be lifted.

6. Alleged Recapture of Claimed Subject Matter

Applicable Law

It is respectfully submitted that pending Claims 27-52 and 56-88 do not improperly recapture subject matter deliberately cancelled in the application for the patent upon which the present reissue is based. In Mentor Corp. v. Coloplast, Inc. 998 F.2d 992, 27 USPQ2d 1521 (Fed. Cir. 1993)., the Federal Circuit stated "*the recapture rule prevents a patentee from regaining through reissue the subject matter that he surrendered in an effort to obtain allowance of the original claims.*" As shall be explained in further detail below, the recapture rule does not apply to pending Claims 27-52 and 56-88 because no pending claim is to a combination that was admitted to be not patentable in the original application.

Indeed, the pending claims are directed towards elements and combinations of elements that have not previously been before the Patent and Trade Office for examination. With respect to originally disclosed but unclaimed subject matter, the Federal Circuit has reiterated as recently as this year that:

> A patentee who inadvertently fails to claim disclosed subject matter, however, is not left without remedy. Within two years from the grant of the original patent, a patentee may file a reissue application and attempt to enlarge the scope of the original claims to include the disclosed but previously unclaimed subject matter. 35 U.S.C. § 251 (2000).

Johnson & Johnston Associates, Inc. v. R.E. Service Co., 62 USPQ2d 1225, 1231 (CA FC 2002).

The claims of a broadening reissue patent may be broader than the issued patent it is based upon, as long as the claims in the broadening reissue application do not contain surrendered subject matter. "*A party may broaden its patent while applying for a reissue claim. The law does not, however, permit attempts to recapture subject matter affirmatively surrendered during the initial patent prosecution, particularly where the purpose of surrender was to distinguish the claimed invention from the prior art.*" B.E. Meyers & Co. v. United States, 47 Fed. Cl. 200, 206, 56 USPQ2d 1110, 1115. "*To determine whether an applicant surrendered particular subject matter, we look at the prosecution history for arguments and changes to the claims made in an effort to overcome a prior art rejection.*" In Re Clement, 142 F.3d at 1480, 46 USPQ2d at 1648.

The patent application that resulted in U.S. Patent no. 5,857,180 consisted of two communicative papers from the Applicants after the application was filed; specifically, a preliminary amendment mailed on July 21, 1997, and an amendment mailed on January 26, 1998. Accordingly, to the extent the recapture doctrine applies, only the preliminary amendment ("the July preliminary amendment") mailed on July 21, 1997 and the amendment ("the January amendment") mailed on January 26, 1998 need to be considered. Thus, in the present broadening reissue, the claims in the reissue application may be broader than the scope of the claims in the original patent, as long as the claims in reissue application contain no subject matter surrendered in the July preliminary amendment or the January amendment.

What Was Surrendered In The Original Application

The July preliminary amendment amended the independent claims, as they existed at that time, to include in the specific arrangement of elements: (a) slave processes (or producer slaves) operate on a plurality of data partitions, and (b) the quantity of data partitions is greater than the quantity of said slave processes (or producer slaves). These features are referred to hereafter as the ("preliminary amendment features"). Thus, to the extent that any admission was made in the July preliminary amendment, the only possible admission is that the specific combination that was recited in the amended claims, prior to the amendment, would not have been novel by itself.

Any theory that would find a broader admission, an admission relating to combinations other than those that were in the amended claims, would be flawed. For example, it would be preposterous to conclude that an amendment that adds a limitation to a specific combination is an admission that **all** subject matter disclosed in an application, whether or not presently in any claim, could not be allowable without the limitation.

The fact that the claims amended in the preliminary amendment were only directed to one aspect of the invention was emphasized in the July preliminary amendment. With that amendment, the Applicant specifically pointed out that "amended Claim 1 of the present application recites a parallelized execution plan including first and second operations, wherein the second operation includes one or more slave processes operating on a plurality of data partitions, the quantity of the data partitions being greater than the quantity of the slave process, each of the slave processes operating on a different one of the data partitions...As set forth above, **this aspect** of the present invention is not taught or suggested by Hong alone or in combination with any of the other cited references (emphasis added)."

The Applicants never stated nor implied that the preliminary amendment features where the only features disclosed in the entire application upon which a finding of novelty could be based. Rather, the Applicants merely pointed out that the specific combination originally recited in the claims, when combined with the preliminary amendment features, produced one novel combination of elements (from a specification that disclosed many such combinations). In other words, the July preliminary amendment was silent as to other aspects of the invention, e.g., subject matter currently not embodied in a claim being examined. Further, the Applicants never argued that the invention was limited to aspects that comprised the preliminary amendment features. **Thus, to the extent that there was a surrender of subject matter in the July preliminary amendment, the admission was that the specific combination of elements of the amended independent claims, in the state they were in prior to the amendment, required the preliminary amendment features for patentability.**

The January amendment amended the independent claims, as they existed at that time, to include the feature that at least one slave process operates on more than one of said data partitions (hereinafter, the "January feature"). The January feature was added in response to a rejection under 35 U.S.C. § 112, second paragraph as being indefinite for allegedly not making it clear how a quantity of data partitions greater than a quantity of slave processes could eventually allow each slave process to operate on a different partition. Granted, this feature was referred to as "key" in that it further distinguished the claims to which it was added over the Hong reference. However, **to the extent that this statement constitutes an admission, it admits nothing more than: at least one slave process must operate on more than one data partition when the quantity of data partitions is greater than the quantity of slave processes that operate on them.**

Applicants submit that not every aspect of the invention involves slave processes, the quantity of slave processes, or how many partitions each slave process works on. Further, in some aspects of the invention that involve slave processes, the reference in the claims may not provoke confusion as to how a quantity of data partitions greater than a quantity of slave processes could eventually allow each slave process to operate on a different partition given the context of the reference of slave processes in the claim.

The Applicants submit that the claims of the present reissue patent application are directed towards combinations of elements that were never before the Patent and Trademark Office for examination previously. Consequently, the right to claim these specific combinations could not have been surrendered. Rather, the subject matter of the current claims was never in a position to be surrendered, as that subject matter, in the particular combinations in which it is now claimed, was never examined by the Patent and Trademark Office.

Reasons Why the Pending Claims do not attempt to Recapture Surrendered Subject Matter

Pending Claims 27-52 and 63-88 do not attempt to recapture surrendered subject matter because the claims are not directed to any combination of elements to which the right to claim was previously surrendered.

Each of the pending claims contains a limitation that does not correspond to any element that was present in the combination of elements recited in the claims of the parent during prosecution. Therefore, it is impossible for the present claims to recapture surrendered subject matter. The logic is this: if a claim is to a combination that includes X, and the original claims were to combinations that did not have X, then any admission that the original claims were not

patentable could not possibly be interpreted as an admission that a combination that includes X is not patentable. Said differently, the "surrender" of a combination that does not include X cannot possibly be interpreted as the surrender of a combination that does include X. The absence of any surrendered subject matter in Claims 27-52 and 63-88 shall be discussed in detail below.

A. Claims 27-37 and 63-73

Claims 27-37 and 63-73 recite the following limitations:

"dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;"

The above-quoted elements were not previously presented for prosecution in the parent application. Therefore, the combination of elements presented in Claims 27-37 and 63-73 was not previously submitted for examination; thus, Claims 27-37 and 63-73 could not possibly recapture surrendered subject matter.

In addition, there are additional reasons why each of Claims 27-37 and 63-73 does not recapture surrendered subject matter. For example, independent Claims 27 and 63 and dependent Claims 28 and 64 recite the limitation of: "wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions." This limitation does not correspond to any element that was present in the combination of elements recited in any claim of the parent application

during prosecution. Therefore, it is respectfully submitted that Claims 27, 28, 63 and 64 do not recapture any surrendered subject.

Independent Claims 29 and 65 recite the limitations of:

> "after said at least one entity has completed operation on said first work partition,
>
> assigning said at least one entity a second work partition from said set of work partitions, wherein the step of assigning said at least one entity a second work partition includes
>
> determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and
>
> if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy;"

These limitations do not correspond to any element or elements that were present in the combination of elements recited in any claims of the parent application during prosecution. Therefore, it is respectfully submitted that Claims 29 and 65 do not recapture any surrendered subject matter.

Independent Claims 30 and 66 and dependent Claims 31-32 and 67-68 recite the following limitation: "the step of dividing an operation is performed by dividing said second operation." This limitation does not correspond to any element that was present in the combination of elements recited in any claim of the parent application during prosecution.

Therefore, it is respectfully submitted that Claims 30-32 and 66-68 do not recapture any surrendered subject matter.

B. Claims 38-41 and 74-77

Independent Claims 38 and 74 feature the limitations of:

"receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;"

The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 38 and 74 were not previously submitted for examination; thus, Claims 38 and 74 could not possibly recapture surrendered subject matter.

Each of dependent Claims 39-41 and 75-77 depend from either independent Claims 38 or 74; thus, each dependent claim contains the limitations discussed above with respect to Claims 38 and 74. As a result, it is respectfully submitted that each of dependent Claims 39-41 and 75-77 do not contain any surrendered subject matter for the reasons discussed above with respect to Claims 38 and 74.

Additionally, dependent Claims 39-41 and 75-77 do not recapture surrendered subject matter for additional reasons than those discussed above with reference to Claims 38 and 74. For example, Claims 39 and 75 feature the limitations of:

"the query requires a plurality of operations; and

the statement specifies said degree of parallelism for a subset of the plurality of operations required by the query."

The above-quoted elements were not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 39 and 75 were not previously submitted for examination; thus, Claims 39 and 75 could not possibly recapture surrendered subject matter.

Claims 40 and 76 feature the limitation of: "wherein the degree of parallelism specified by the query indicates that no amount of parallelism is to be used during execution of a particular portion of the query." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 40 and 76 were not previously submitted for examination; thus, Claims 40 and 76 could not possibly recapture surrendered subject matter.

Claims 41 and 77 feature the limitation of: "wherein the degree of parallelism specified by the query indicates a maximum amount of parallelism to use during execution of said operation." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 41 and 77 were not previously submitted for examination; thus, Claims 41 and 77 could not possibly recapture surrendered subject matter.

C. Claims 42-48 and 78-84

Independent Claims 42 and 78 feature the limitations of:

"incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment."

The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 42 and 78 were not previously submitted for examination; thus, Claims 42 and 78 could not possibly recapture surrendered subject matter.

Each of dependent Claims 43-48 and 79-84 depend from either independent Claims 42 or 78; thus, each contains the limitations discussed above with respect to Claims 42 and 78. As a result, it is respectfully submitted that each of dependent Claims 43-48 and 79-84 does not recapture any surrendered subject matter for the reasons discussed above with respect to Claims 42 and 78.

Additionally, dependent Claims 43-48 and 79-84 do not recapture surrendered subject matter for additional reasons than those discussed above with reference to Claims 42 and 78. For example, Claims 43 and 79 feature the limitation of: "wherein the step of incorporating hints includes incorporating hints that dictate the operation of a table scan." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 43 and 79 were not previously submitted for examination; thus, Claims 43 and 79 could not possibly recapture surrendered subject matter.

Claims 44 and 80 feature the limitation of: "wherein the step of incorporating hints dictate the operation of a table scan includes incorporating hints that rowed partitioning is to be used during the table scan." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 44 and 80 were not previously submitted for examination; thus, Claims 44 and 80 could not possibly recapture surrendered subject matter.

Claims 45 and 81 feature the limitation of: "wherein the step of incorporating hints includes incorporating hints that specify performance of a full table scan." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 45 and 81 were not previously submitted for examination; thus, Claims 45 and 81 could not possibly recapture surrendered subject matter.

Claims 46 and 82 feature the limitation of: "wherein the step of incorporating hints includes incorporating hints that specify using a particular type of join." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 46 and 82 were not previously submitted for examination; thus, Claims 46 and 82 could not possibly recapture surrendered subject matter.

Claims 47 and 83 feature the limitation of: "wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a sort/merge join." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 47 and 83 were not previously submitted for examination; thus, Claims 47 and 83 could not possibly recapture surrendered subject matter.

Claims 48 and 84 feature the limitation of: "wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a nested loop join." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 48 and 84 were not previously submitted for examination; thus, Claims 48 and 84 could not possibly recapture surrendered subject matter.

D. Claims 49-52 and 85-88

Independent Claims 49 and 85 feature the limitations of:

"determining a hierarchy of operations associated with a query;

dividing a first operation required by said query into a first set of work partitions;

dividing a second operation required by said query into a second set of work partitions, wherein said second operation immediately follows said first operation in said hierarchy;

dividing a third operation required by said query into a third set of work partitions, wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

said first plurality of entities operating in parallel on work partitions assigned to them from said first set of work partitions to perform said first operation;

assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities; and

said second plurality of entities operating in parallel on work partitions assigned to them from said second set of work partitions to perform said second operation;

assigning work partitions from said third set of work partitions to said first plurality of entities; and

said first plurality of entities operating in parallel on work partitions assigned to them from said third set of work partitions to perform said third operation."

The above-quoted elements were not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 49 and 85 were not previously submitted for examination; thus, Claims 49 and 85 could not possibly recapture surrendered subject matter.

Each of dependent Claims 50-52 and 86-88 depend from either independent Claims 49 or 85; thus, each contains the limitations discussed above with respect to Claims 49 and 85. As a result, it is respectfully submitted that each of dependent Claims 50-52 and 86-88 does not recapture any surrendered subject matter for the reasons discussed above with respect to Claims 49 and 85.

Additionally, dependent Claims 50-52 and 86-88 do not recapture surrendered subject matter for additional reasons than those discussed above with reference to Claims 49 and 85. For example, Claims 50 and 86 feature the limitations of:

"determining whether there are any unassigned work partitions from said first set of work partitions; and

if there are no unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said third set of work partitions; and

if there are unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said first set of work partitions."

The above-quoted elements were not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 50 and 86 were not

previously submitted for examination; thus, Claims 50 and 86 could not possibly recapture surrendered subject matter.

Claims 51 and 87 feature the limitation of: "wherein the hierarchy includes odd levels and even levels, and the method further comprises the steps of assigning work partitions from odd levels to said first plurality of entities and work partitions from even levels to said second plurality of entities." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 51 and 87 were not previously submitted for examination; thus, Claims 51 and 87 could not possibly recapture surrendered subject matter.

Claims 52 and 88 feature the limitation of: "wherein performing work partitions in said first set of work partitions causes said first set of entities produce output consumed by said second plurality of entities, and performing work partitions in said third set of work partitions causes said first set of entities to consume output produced by said second plurality of entities." The above-quoted element was not previously presented for prosecution in the parent application. Therefore, the combination of elements claimed by Claims 52 and 88 were not previously submitted for examination; thus, Claims 52 and 88 could not possibly recapture surrendered subject matter.

RESPONSE TO REJCTIONS BASED ON THE CITED ART

The Applicants respectfully submit that pending Claims 27-52 and 56-88 are patentable over Hong because Hong fails to disclose, teach, or suggest elements within each of the pending claims. Each independent claim will be addressed separately below.

Claim 27

Independent Claim 27 features the following element:

> "assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions;"

The Office Action mailed July 17, 2002 acknowledged that Hong must preserve the relative order in which the one or more segments can be executed so that correct data can be returned from a query. In other words, Hong only discloses assigning work partitions in a fixed sequence, rather than based at least in part on sizes associated with the work partitions, as featured in Claim 27.

Specifically, Claim 27 requires "wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions." This is not shown in Hong. As Hong is lacking any suggestion of assigning work partitions in a sequence based at least in part on sizes associated with the work partitions, it is respectfully submitted that Claim 27 is patentable over the cited art, and is in condition for allowance.

Claim 29

Independent Claim 29 features the following elements:

> "the operation is specified in a query that corresponds to a hierarchy of operations; and

the step of assigning said at least one entity a second work partition includes

determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and

if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy."

The above-cited elements are not disclosed, taught, or suggested by Hong. Moreover, the Office Action does not even attempt to identify any portion of Hong that discloses the above-cited elements. Further, it is respectfully submitted that Hong is completely lacking any suggestion of "selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy," let alone the concept of performing that action when there are no unassigned work partitions from the first level in the hierarchy. Accordingly, the Applicants respectfully submit that Claim 29 is patentable over the cited art, and is in condition for allowance.

Claim 30

Independent Claim 30 features the following elements:

"the method includes the step of generating a serial execution plan for operations in a database management system (DBMS) running on a computer system;

the method includes the step of generating a parallelized execution plan for said serial execution plan, said parallelized execution plan including first and second operations;

the step of dividing an operation is performed by dividing said second operation;

the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

executing said parallelized execution plan when a plurality of parallel resources of said computer system are available; and

executing said serial execution plan when said plurality of resources are not available."

The above-cited elements are not disclosed, taught, or suggested by Hong. It is noted that the Office Action does not identify any portion of Hong that discloses the above elements. For example, the Office Action does not point to any portion of Hong that discloses, "the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes." Accordingly, the Applicants respectfully submit that Claim 30 is patentable over the cited art, and is in condition for allowance.

Claim 33

Independent Claim 33 features the following elements:

"generating an execution plan for said operation;

examining said execution plan from bottom up;

identifying a parallelized portion of said execution plan, said parallelized portion can be processed in parallel, said parallelized portion including first and second operations, said first and second operations being executable in parallel;

wherein the step of dividing the operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operation on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

identifying some serial portion of said execution plan, said serial portion can be processed in serial; and

allocating a central scheduler between said parallelized portion and said serial portion."

The above-cited elements are not disclosed, taught, or suggested by Hong. It is noted that the Office Action does not even attempt to point to any portion of Hong that discloses the above elements. For example, the Office Action does not point to any portion of Hong that discloses, "examining said execution plan from bottom up," nor has the Office Action cited a portion of Hong that discloses "the quantity of said data partitions being greater than the quantity of said slave processes." Accordingly, the Applicants respectfully submit that Claim 33 is patentable over the cited art, and is in condition for allowance.

Claim 35

Independent Claim 35 features the following elements:

"generating an execution plan to execute database management system (DBMS) operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation is performed by dividing said second operation;

initiating an operation coordinator in a computer system to coordinate execution of said execution plan;

initiating, by said operation coordinator, a first set of slaves operating on a plurality of data partitions to produce data, the quantity of said data partitions being greater than the quantity of said first set of slave processes;

initiating, as said plurality of entities, by said operation coordinator, a second set of slaves to consume data; and

directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data."

The above-cited elements are not disclosed, taught, or suggested by Hong.

The Applicants respectfully note that the Office Action does not point to any portion of Hong that discloses the above elements. For example, the Office Action has not cited any portion of Hong that discloses, "directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data." Additionally, the Office Action has not cited any portion of Hong that discloses "the quantity of said data partitions being greater than the quantity of said first set of slave processes." Accordingly, the

Applicants respectfully submit that Claim 35 is patentable over the cited art, and is in condition for allowance.

Claim 37

Independent Claim 37 features the following elements:

"generating an execution plan to execute said operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation includes dividing said first operation;

initiating producer slaves operating on a plurality of data partitions to produce a first data production;

initiating consumer slaves to consume said first data production;

when said first data production is completed, generating an identification of a plurality of said consumer slaves that did not receive data in said first data production;

examining said identification during a subsequent data production; and

reducing said subsequent data production such that said subsequent data production does not produce data for said plurality of said consumer slaves."

The above-cited elements are not disclosed, taught, or suggested by Hong. In fact, the Office Action does not even attempt to point to any portion of Hong that discloses the above elements. For example, the Office Action has not pointed to any portion of Hong that discloses, "reducing said subsequent data production such that said subsequent data production does not produce data

for said plurality of said consumer slaves." Accordingly, the Applicants respectfully submit that Claim 37 is patentable over the cited art, and is in condition for allowance.

Claim 38

Independent Claim 38 features the following elements:

"receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;

dividing the operation into a set of work partitions;

performing a determination of how many entities to use to perform said operation based, at least in part, on the degree of parallelism specified in said statement;"

The above-cited elements are not disclosed, taught, or suggested by Hong.

The Office Action of July 17, 2002 asserted that "Hong discloses a degree of parallelism to use in performing the operation since the parallellizer in Hong's method decomposes a sequential query execution plan into a set of fragments for execution. The degree of parallelism, is based upon the disk bandwidth and the number of free processor (page 225, left column, lines 29-32)." While this may be so, Hong does not teach determining the degree of parallelism based upon information specified in the received statement. Claim 38 requires "receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation." Hong does not show this feature, as the degree of parallelism is based upon the disk bandwidth and the number of free processor, as opposed to specifying the degree of parallelism in the statement (page 225, left column, lines 29-32)."

In rejecting Claims 39-41, the Office Action states that Hong teaches a statement specifying said degree of parallelism; however, it is respectfully submitted that the cited portion of Hong (Page 219, right column, lines 1-18) is absent of the concept of a statement that specifies "at least (a) an operation and (b) a degree of parallelism to use in performing the operation." Accordingly, the Applicants respectfully submit that Claim 38 is patentable over the cited art, and is in condition for allowance.

Claim 42

Independent Claim 42 features the following elements:

"dividing an operation required by said query into a set of work partitions by generating a set of query fragments;

incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment;"

The above-cited elements are not disclosed, taught, or suggested by Hong. In fact, the Office Action does not point to any portion of Hong that discloses the above elements. For example, the Office Action does not cite any portion of Hong that discloses "incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment," as required by Claim 42. The Applicants respectfully submit that Hong is absent of the concept of incorporating hints into query fragments. Accordingly, the Applicants respectfully submit that Claim 42 is patentable over the cited art, and is in condition for allowance.

Claim 49

Independent Claim 49 features the following elements:

"determining a hierarchy of operations associated with a query;

dividing a first operation required by said query into a first set of work partitions;

dividing a second operation required by said query into a second set of work partitions, wherein said second operation immediately follows said first operation in said hierarchy;

dividing a third operation required by said query into a third set of work partitions, wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

...assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities;

...assigning work partitions from said third set of work partitions to said first plurality of entities;"

The above-cited elements are not disclosed, taught, or suggested by Hong.

In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office Action does not cite any portion of Hong that discloses, "determining a hierarchy of operations associated with a query." The Office Action also does not cite any portion of Hong that discloses "assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities

are different entities than said first plurality of entities", nor cited any portion of Hong that discloses "assigning work partitions from said third set of work partitions to said first plurality of entities." Accordingly, the Applicants respectfully submit that Claim 49 is patentable over the cited art, and is in condition for allowance.

Claim 63

Independent Claim 63 features the following elements:

> "assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions;"

The Office Action mailed July 17, 2002 acknowledged that Hong must preserve the relative order in which the one or more segments can be executed so that correct data can be returned from a query. In other words, Hong only discloses assigning work partitions in a fixed sequence, rather than based at least in part on sizes associated with the work partitions, as featured in Claim 63.

Specifically, Claim 63 requires "wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions." This is not shown in Hong. As Hong is absent the suggestion of assigning work partitions in a sequence based at least in part on sizes associated with the work partitions, it is respectfully submitted that Claim 63 is patentable over the cited art, and is in condition for allowance.

Claim 65

Independent Claim 65 features the following elements:

"the operation is specified in a query that corresponds to a hierarchy of operations; and

the step of assigning said at least one entity a second work partition includes

determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and

if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy."

The above-cited elements are not disclosed, taught, or suggested by Hong. Moreover, the Office Action does not point to any portion of Hong that discloses the above-cited elements. Further, it is respectfully submitted that Hong is absent of "selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy," let alone the concept of performing that action when there are no unassigned work partitions from the first level in the hierarchy. Accordingly, the Applicants respectfully submit that Claim 65 is patentable over the cited art, and is in condition for allowance.

Claim 66

Independent Claim 66 features the following elements:

"the method includes the step of generating a serial execution plan for operations in a database management system (DBMS) running on a computer system;

the method includes the step of generating a parallelized execution plan for said serial execution plan, said parallelized execution plan including first and second operations;

the step of dividing an operation is performed by dividing said second operation;

the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

executing said parallelized execution plan when a plurality of parallel resources of said computer system are available; and

executing said serial execution plan when said plurality of resources are not available."

The above-cited elements are not disclosed, taught, or suggested by Hong. In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office Action does not point to any portion of Hong that discloses, "the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes." Accordingly, the Applicants respectfully submit that Claim 66 is patentable over the cited art, and is in condition for allowance.

Claim 69

Independent Claim 69 features the following elements:

"generating an execution plan for said operation;

examining said execution plan from bottom up;

identifying a parallelized portion of said execution plan, said parallelized portion can be processed in parallel, said parallelized portion including first and second operations, said first and second operations being executable in parallel;

wherein the step of dividing the operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operation on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

identifying some serial portion of said execution plan, said serial portion can be processed in serial; and

allocating a central scheduler between said parallelized portion and said serial portion."

The above-cited elements are not disclosed, taught, or suggested by Hong.

In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office Action does not point to any portion of Hong that discloses, "examining said execution plan from bottom up," nor has the Office Action cited a portion of Hong that discloses "the quantity of said data partitions being greater than the quantity of said slave processes." Accordingly, the Applicants respectfully submit that Claim 69 is patentable over the cited art, and is in condition for allowance.

Claim 71

Independent Claim 71 features the following elements:

"generating an execution plan to execute database management system (DBMS) operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation is performed by dividing said second operation;

initiating an operation coordinator in a computer system to coordinate execution of said execution plan;

initiating, by said operation coordinator, a first set of slaves operating on a plurality of data partitions to produce data, the quantity of said data partitions being greater than the quantity of said first set of slave processes;

initiating, as said plurality of entities, by said operation coordinator, a second set of slaves to consume data; and

directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data."

The above-cited elements are not disclosed, taught, or suggested by Hong.

In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office Action has not cited any portion of Hong that discloses, "directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data." Additionally, the Office Action has not cited any portion of Hong that discloses "the quantity of said data partitions being

greater than the quantity of said first set of slave processes." Accordingly, the Applicants respectfully submit that Claim 71 is patentable over the cited art, and is in condition for allowance.

Claim 73

Independent Claim 73 features the following elements:

"generating an execution plan to execute said operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation includes dividing said first operation;

initiating producer slaves operating on a plurality of data partitions to produce a first data production;

initiating consumer slaves to consume said first data production;

when said first data production is completed, generating an identification of a plurality of said consumer slaves that did not receive data in said first data production;

examining said identification during a subsequent data production; and

reducing said subsequent data production such that said subsequent data production does not produce data for said plurality of said consumer slaves."

The above-cited elements are not disclosed, taught, or suggested by Hong. In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office Action has not cited any portion of Hong that discloses, "reducing said subsequent data production such that said subsequent data production does not produce data for

said plurality of said consumer slaves." Accordingly, the Applicants respectfully submit that Claim 73 is patentable over the cited art, and is in condition for allowance.

Claim 74

Independent Claim 74 features the following elements:

"receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;

dividing the operation into a set of work partitions;

performing a determination of how many entities to use to perform said operation based, at least in part, on the degree of parallelism specified in said statement;"

The above-cited elements are not disclosed, taught, or suggested by Hong.

The Office Action of July 17, 2002 asserted that "Hong discloses a degree of parallelism to use in performing the operation since the parallellizer in Hong's method decomposes a sequential query execution plan into a set of fragments for execution. The degree of parallelism, is based upon the disk bandwidth and the number of free processor (page 225, left column, lines 29-32)." The Applicants respectfully submit that while this may be so, Hong does not teach determining the degree of parallelism based upon information specified in the received statement. Claim 74 requires "receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation." Hong does not show this feature, as the degree of parallelism is based upon the disk bandwidth and the number of free processor, as opposed to specifying the degree of parallelism in the statement (page 225, left column, lines 29-32)."

In rejecting Claims 39-41, the Office Action states that Hong teaches a statement specifying said degree of parallelism; however, it is respectfully submitted that the cited portion of Hong (Page 219, right column, lines 1-18) is entirely lacking the concept of a statement that specifies "at least (a) an operation and (b) a degree of parallelism to use in performing the operation." Accordingly, the Applicants respectfully submit that Claim 74 is patentable over the cited art, and is in condition for allowance.

Claim 78

Independent Claim 78 features the following elements:

"dividing an operation required by said query into a set of work partitions by generating a set of query fragments;

incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment;"

The above-cited elements are not disclosed, taught, or suggested by Hong. In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office action has not cited any portion of Hong that discloses "incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment," as required by Claim 78. The Applicants respectfully submit that Hong is absent of the concept of incorporating hints into query fragments. Accordingly, the Applicants respectfully submit that Claim 78 is patentable over the cited art, and is in condition for allowance.

Claim 85

Independent Claim 85 features the following elements:

"determining a hierarchy of operations associated with a query;

dividing a first operation required by said query into a first set of work partitions;

dividing a second operation required by said query into a second set of work partitions, wherein said second operation immediately follows said first operation in said hierarchy;

dividing a third operation required by said query into a third set of work partitions, wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

...assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities;

...assigning work partitions from said third set of work partitions to said first plurality of entities;"

The above-cited elements are not disclosed, taught, or suggested by Hong.

In fact, the Office Action does not even point to any portion of Hong that discloses the above elements. For example, the Office Action has not cited any portion of Hong that discloses, "determining a hierarchy of operations associated with a query." The Office Action also has not cited any portion of Hong that discloses "assigning work partitions from said second

set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities", nor cited any portion of Hong that discloses "assigning work partitions from said third set of work partitions to said first plurality of entities." Accordingly, the Applicants respectfully submit that Claim 49 is patentable over the cited art, and is in condition for allowance.

Dependent Claims 28, 31, 32, 34, 36, 39, 40, 41, 43-48, 50-52, 57-62, 64, 67, 68, 70, 72, 74-77, 79-84, and 86-88

As each of dependent Claims 28, 31, 32, 34, 36, 39, 40, 41, 43-48, 50-52, 57-62, 64, 67, 68, 70, 72, 74-77, 79-84, and 86-88 depend from one of independent claims 27, 29, 30, 33, 35, 37, 38, 42, 49, 63, 65, 66, 69, 71, 73, 74, 78, and 85, each dependent claim contain the limitations of the independent claim from which they depend from. Accordingly, it is respectfully submitted that dependent Claims 28, 31, 32, 34, 36, 39, 40, 41, 43-48, 50-52, 57-62, 64, 67, 68, 70, 72, 74-77, 79-84, and 86-88 are in condition for allowance for at least the reasons discussed above with respect to independent claims 27, 29, 30, 33, 35, 37, 38, 42, 49, 63, 65, 66, 69, 71, 73, 74, 78, and 85.

CONCLUSION

For the reasons set forth above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a formal Notice of Allowance is believed next in order, and that action is most earnestly solicited.

The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

Please charge any shortages or credit any overages to Deposit Account No. 50-1302.

Respectfully submitted,
HICKMAN PALERMO TRUONG & BECKER LLP

Dated: October 17, 2002

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231

on October 17, 2002 by

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS RELATIVE TO U.S. PATENT NO. 5,857,180

In accordance with CFR § 1.173(g), which states that all amendments must be made relative to the patent specification, including the claims, the following claims are underlined to indicate that the claims have been added since the parent patent issued. To avoid confusion, claims cancelled by this paper shall be listed below.

1 20. (Cancelled)

1 21. (Cancelled)

1 22. (Cancelled)

1 23. (Cancelled)

1 24. (Cancelled)

1 25. (Cancelled)

1 26. (Cancelled)

27. (Twice Amended) A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

28. (Unchanged) The method of Claim 27 wherein the step of assigning the work partitions in a sequence is performed by assigning relatively larger work partitions before assigning relatively smaller work partitions.

29. (Twice Amended) A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions, wherein the step of assigning work partitions includes:

assigning said at least one entity a first work partition from said set of work partitions; and

after said at least one entity has completed operation on said first work partition, assigning said at least one entity a second work partition from said set of work partitions, wherein the step of assigning said at least one entity a second work partition includes

determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and

if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation; and

wherein the operation is specified in a query that corresponds to a hierarchy of operations.

30. (Once Amended) A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

the method includes the step of generating a serial execution plan for operations in a database management system (DBMS) running on a computer system;

the method includes the step of generating a parallelized execution plan for said serial execution plan, said parallelized execution plan including first and second operations;

the step of dividing an operation is performed by dividing said second operation;

the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

executing said parallelized execution plan when a plurality of parallel resources of said computer system are available; and

executing said serial execution plan when said plurality of resources are not available.

31. (Unchanged) The method of claim 30 wherein said step of generating a parallelized execution plan includes the steps of:

identifying one or more segments of said serial execution plan that can be parallelized; and

identifying partitioning requirements of said one or more segments.

32. (Unchanged) The method of claim 30 wherein said step of generating a parallelized execution plan is based on a specification of parallelism in a statement specifying one of said operations.

33. (Once Amended) A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan for said operation;

examining said execution plan from bottom up;

identifying a parallelized portion of said execution plan, said parallelized portion can be processed in parallel, said parallelized portion including first and second operations, said first and second operations being executable in parallel;

wherein the step of dividing the operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

identifying some serial portion of said execution plan, said serial portion can be processed in serial; and

allocating a central scheduler between said parallelized portion and said serial portion.

34. (Unchanged) The method of Claim 33 further including the steps of:

identifying a first data flow requirement for a first portion of said execution plan said first data flow requirement corresponding to a partitioning of a data flow required by said first portion;

identifying a second data flow requirement for a second portion of said execution plan said second data flow requirement corresponding by said second portion; and

allocating a data flow director between said first portion and said second portion when said first data flow requirement is not compatible with said second data flow requirement said data flow director repartitioning a data flow of said first portion to be compatible with said second data flow requirement.

35. (Once amended) A method for parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute database management system (DBMS) operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation is performed by dividing said second operation;

initiating an operation coordinator in a computer system to coordinate execution of said execution plan;

initiating, by said operation coordinator, a first set of slaves operating on a plurality of data partitions to produce data, the quantity of said data partitions being greater than the quantity of said first set of slave processes;

initiating, as said plurality of entities, by said operation coordinator, a second set of slaves to consume data; and

directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data.

36. (Once amended) The method of claim 35 wherein said execution plan is comprised of operator nodes and said operator nodes are linked together to form execution sets.

37. (Once amended) A method for parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute said operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation includes dividing said first operation;

initiating producer slaves operating on a plurality of data partitions to produce a first data production;

initiating consumer slaves to consume said first data production;

when said first data production is completed, generating an identification of a plurality of said consumer slaves that did not receive data in said first data production;

examining said identification during a subsequent data production; and

reducing said subsequent data production such that said subsequent data production does not produce data for said plurality of said consumer slaves.

38. (Unchanged) A method for processing a query, the method comprising the steps of:

receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;

dividing the operation into a set of work partitions;

performing a determination of how many entities to use to perform said operation based, at least in part, on the degree of parallelism specified in said statement;

assigning work partitions from said set of work partitions to a plurality of entities based on said determination; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

39. (Unchanged) The method of Claim 38 wherein:
the query requires a plurality of operations; and
the statement specifies said degree of parallelism for a subset of the plurality of operations required by the query.

40. (Unchanged) The method of Claim 39 wherein the degree of parallelism specified by the query indicates that no amount of parallelism is to be used during execution of a particular portion of the query.

41. (Unchanged) The method of Claim 38 wherein the degree of parallelism specified by the query indicates a maximum amount of parallelism to use during execution of said operation.

42. (Unchanged) A method of processing a query, the method comprising the steps of:
dividing an operation required by said query into a set of work partitions by generating a set of query fragments;
incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment;
assigning query fragments from said set of query fragments to a plurality of entities; and

said plurality of entities operating in parallel on query fragments assigned to them to perform said operation, wherein entities working on a query fragment associated with a hint perform the work partition associated with said query fragment in a manner dictated by said hint.

43. (Unchanged) The method of Claim 42 wherein the step of incorporating hints includes incorporating hints that dictate the operation of a table scan.

44. (Once amended) The method of Claim 43 wherein the step of incorporating hints that dictate the operation of a table scan includes incorporating hints that rowid partitioning is to be used during the table scan.

45. (Unchanged) The method of Claim 42 wherein the step of incorporating hints includes incorporating hints that specify performance of a full table scan.

46. (Unchanged) The method of Claim 42 wherein the step of incorporating hints includes incorporating hints that specify using a particular type of join.

47. (Unchanged) The method of Claim 46 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a sort/merge join.

48. (Unchanged) The method of Claim 46 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a nested loop join.

49. (Unchanged) A method of processing a query, the method comprising the steps of:

determining a hierarchy of operations associated with a query;

dividing a first operation required by said query into a first set of work partitions;

dividing a second operation required by said query into a second set of work partitions, wherein said second operation immediately follows said first operation in said hierarchy;

dividing a third operation required by said query into a third set of work partitions, wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

said first plurality of entities operating in parallel on work partitions assigned to them from said first set of work partitions to perform said first operation;

assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities; and

said second plurality of entities operating in parallel on work partitions assigned to them from said second set of work partitions to perform said second operation;

assigning work partitions from said third set of work partitions to said first plurality of entities; and

said first plurality of entities operating in parallel on work partitions assigned to them from said third set of work partitions to perform said third operation.

50. (Unchanged) The method of Claim 49 further comprising performing the following steps when a given entity in said first set of entities finishes performing a work partition from said first set of work partitions:

determining whether there are any unassigned work partitions from said first set of work partitions; and

if there are no unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said third set of work partitions; and

if there are unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said first set of work partitions.

51. (Unchanged) The method of Claim 49 wherein the hierarchy includes odd levels and even levels, and the method further comprises the steps of assigning work partitions from odd levels to said first plurality of entities and work partitions from even levels to said second plurality of entities.

52. (Unchanged) The method of Claim 49 wherein performing work partitions in said first set of work partitions causes said first set of entities produce output consumed by said second plurality of entities, and performing work partitions in said third set of work partitions causes said first set of entities to consume output produced by said second plurality of entities.

56. (Cancelled)

57. (Cancelled)

58. (Cancelled)

59. (Cancelled)

60. (Cancelled)

61. (Cancelled)

62. (Cancelled)

63. (Once amended) A computer-readable medium carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,
wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions; and
said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

64. (Unchanged) The computer-readable medium of Claim 63 wherein the step of assigning the work partitions in a sequence is performed by assigning relatively larger work partitions before assigning relatively smaller work partitions.

65. (Twice Amended) A computer-readable medium carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:
dividing the operation into a set of work partitions;
assigning work partitions from said set of work partitions to a plurality of entities,
wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions, wherein the step of assigning work partitions includes
assigning said at least one entity a first work partition from said set of work partitions; and

after said at least one entity has completed operating on said first work partition, assigning said at least one entity a second work partition from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

wherein the operation is specified in a query that corresponds to a hierarchy of operations; and

the step of assigning said at least one entity a second work partition includes determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and

if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy.

66. (Once amended) A computer-readable medium carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operation in parallel on work partitions assigned to them to perform said operation;

wherein the instructions include instructions for performing the step of generating a serial execution plan for operations in a database management system (DBMS) running on a computer system;

wherein the instructions include instructions for performing the step of generating a parallelized execution plan for said serial execution plan, said parallelized execution plan including first and second operations;

wherein the step of dividing an operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

wherein the instructions include instructions for performing the step of executing said parallelized execution plan when a plurality of parallel resources of said computer system are available; and

wherein the instructions include instructions for performing the step of executing said serial execution plan when said plurality of resources are not available.

67. (Unchanged) The computer-readable medium of claim 66 wherein said step of generating a parallelized execution plan includes the steps of:

identifying one or more segments of said serial execution plan that can be parallelized; and

identifying partitioning requirements of said one or more segments.

68. (Unchanged) The computer-readable medium of claim 66 wherein said step of generating a parallelized execution plan is based on a specification of parallelism in a statement specifying one of said operations.

69. (Once amended) A computer-readable medium carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform some operation;

generating an execution plan for said operation;

examining said execution plan from bottom up;

identifying a parallelized portion of said execution plan, said parallelized portion can be processed in parallel, said parallelized portion including first and second operations, said first and second operations being executable in parallel;

wherein the step of dividing the operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

identifying some serial portion of said execution plan, said serial portion can be processed in serial; and

allocating a central scheduler between said parallelized portion and said serial portion.

70. (Unchanged) The computer-readable medium of Claim 69 further including instructions for performing the steps of:

identifying a first data flow requirement for a first portion of said execution plan said first data flow requirement corresponding to a partitioning of a data flow required by said first portion;

identifying a second data flow requirement for a second portion of said execution plan said second data flow requirement corresponding by said second portion; and

allocating a data flow director between said first portion and said second portion when said first data flow requirement is not compatible with said second data flow requirement said data flow director repartitioning a data flow of said first portion to be compatible with said second data flow requirement.

71. (Once amended) A computer-readable medium carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute database management system (DBMS) operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation is performed by dividing said second operation;

initiating an operation coordinator in a computer system to coordinate execution of said execution plan;

initiating, by said operation coordinator, a first set of slaves operating on a plurality of data partitions to produce data, the quantity of said data partitions being greater than the quantity of said first set of slave processes;

initiating, as said plurality of entities, by said operation coordinator, a second set of slaves to consume data; and

directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data.

72. (Once amended) The computer-readable medium of claim 71 wherein said execution plan is comprised of operator nodes and said operator nodes are linked together to form execution sets.

73. (Once amended) A computer-readable medium carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute said operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation includes dividing said first operation;

initiating producer slaves operating on a plurality of data partitions to produce a first data production;

initiating consumer slaves to consume said first data production;

when said first data production is completed, generating an identification of a plurality of said consumer slaves that did not receive data in said first data production;

examining said identification during a subsequent data production; and

reducing said subsequent data production such that said subsequent data production does not produce data for said plurality of said consumer slaves.

74. (Unchanged) A computer-readable medium storing instructions for processing a query, the instructions including instructions for performing the steps of:

receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;

dividing the operation into a set of work partitions;

performing a determination of how many entities to use to perform said operation based, at least in part, on the degree of parallelism specified in said statement;

assigning work partitions from said set of work partitions to a plurality of entities based on said determination; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

75. (Unchanged) The computer-readable medium of Claim 74 wherein:

the query requires a plurality of operations; and

the statement specifies said degree of parallelism for a subset of the plurality of operations required by the query.

76. (Unchanged) The computer-readable medium of Claim 75 wherein the degree of parallelism specified by the query indicates that no amount of parallelism is to be used during execution of a particular portion of the query.

77. (Unchanged) The computer-readable medium of Claim 74 wherein the degree of parallelism specified by the query indicates a maximum amount of parallelism to use during execution of said operation.

78. (Unchanged) A computer-readable medium carrying instructions for processing a query, the instructions including instructions for performing the steps of:

dividing an operation required by said query into a set of work partitions by generating a set of query fragments;

incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment;

assigning query fragments from said set of query fragments to a plurality of entities; and

said plurality of entities operating in parallel on query fragments assigned to them to perform said operation, wherein entities working on a query fragment associated with a hint perform the work partition associated with said query fragment in a manner dictated by said hint.

79. (Unchanged) The computer-readable medium of Claim 78 wherein the step of incorporating hints includes incorporating hints that dictate the operation of a table scan.

80. (Once amended) The computer-readable medium of Claim 79 wherein the step of incorporating hints that dictate the operation of a table scan includes incorporating hints that rowid partitioning is to be used during the table scan.

81. (Unchanged) The computer-readable medium of Claim 78 wherein the step of incorporating hints includes incorporating hints that specify performance of a full table scan.

82. (Unchanged) The computer-readable medium of Claim 78 wherein the step of incorporating hints includes incorporating hints that specify using a particular type of join.

83. (Unchanged) The computer-readable medium of Claim 82 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a sort/merge join.

84. (Unchanged) The computer-readable medium of Claim 82 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a nested loop join.

85. (Unchanged) A computer-readable medium carrying instructions for processing a query, the instructions including instructions for performing the steps of:
determining a hierarchy of operations associated with a query;
dividing a first operation required by said query into a first set of work partitions;
dividing a second operation required by said query into a second set of work partitions,
wherein said second operation immediately follows said first operation in said hierarchy;
dividing a third operation required by said query into a third set of work partitions,
wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

said first plurality of entities operating in parallel on work partitions assigned to them from said first set of work partitions to perform said first operation;

assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities; and

said second plurality of entities operating in parallel on work partitions assigned to them from said second set of work partitions to perform said second operation;

assigning work partitions from said third set of work partitions to said first plurality of entities; and

said first plurality of entities operating in parallel on work partitions assigned to them from said third set of work partitions to perform said third operation.

86. (Unchanged) The computer-readable medium of Claim 85 further comprising instructions for performing the following steps when a given entity in said first set of entities finishes performing a work partition from said first set of work partitions:

determining whether there are any unassigned work partitions from said first set of work partitions; and

if there are no unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said third set of work partitions; and

if there are unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said first set of work partitions.

87. (Unchanged) The computer-readable medium of Claim 85 wherein the hierarchy includes odd levels and even levels, and the instructions further include instructions for performing the steps of assigning work partitions from odd levels to said first plurality of entities and work partitions from even levels to said second plurality of entities.

88. (Unchanged) The computer-readable medium of Claim 85 wherein performing work partitions in said first set of work partitions causes said first set of entities produce output consumed by said second plurality of entities, and performing work partitions in said third set of work partitions causes said first set of entities to consume output produced by said second plurality of entities.

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS IN THIS AMENDMENT

For purposes of showing the changes in the claims from the last communication from the Applicants, deleted text is shown in [brackets] and added text is underlined. All pending claims are reproduced below in marked-up form, whether or not amended, for the convenience of examination.

1 20. (Cancelled)

1 21. (Cancelled)

1 22. (Cancelled)

1 23. (Cancelled)

1 24. (Cancelled)

1 25. (Cancelled)

1 26. (Cancelled)

27. (Twice Amended) [The method of Claim 20] A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

28. (Unchanged) The method of Claim 27 wherein the step of assigning the work partitions in a sequence is performed by assigning relatively larger work partitions before assigning relatively smaller work partitions.

29. (Twice Amended) [The method of Claim 22 wherein:] A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions, wherein the step of assigning work partitions includes:

assigning said at least one entity a first work partition from said set of work partitions; and

after said at least one entity has completed operation on said first work partition, assigning said at least one entity a second work partition from said set of work partitions, wherein the step of assigning said at least one entity a second work partition includes

determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and

if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation; and

wherein [:] the operation is specified in a query that corresponds to a hierarchy of operations[; and].

30. (Once Amended) [The method of Claim 20 wherein:] A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

the method includes the step of generating a serial execution plan for operations in a database management system (DBMS) running on a computer system;

the method includes the step of generating a parallelized execution plan for said serial execution plan, said parallelized execution plan including first and second operations;

the step of dividing an operation is performed by dividing said second operation;

the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

executing said parallelized execution plan when a plurality of parallel resources of said computer system are available; and

executing said serial execution plan when said plurality of resources are not available.

31. (Once amended) The method of claim 30 wherein said step of generating a parallelized execution plan includes the steps of:

identifying one or more segments of said serial execution plan that can be parallelized; and

identifying partitioning requirements of said one or more segments.

32. (Unchanged) The method of claim 30 wherein said step of generating a parallelized execution plan is based on a specification of parallelism in a statement specifying one of said operations.

33. (Once Amended) [The method of Claim 20 further comprising the steps of:] A method of parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan for said operation;

examining said execution plan from bottom up;

identifying a parallelized portion of said execution plan, said parallelized portion can be processed in parallel, said parallelized portion including first and second operations, said first and second operations being executable in parallel;

wherein the step of dividing the operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

identifying some serial portion of said execution plan, said serial portion can be processed in serial; and

allocating a central scheduler between said parallelized portion and said serial portion.

34. (Once amended) The method of Claim 33 further including the steps of:

identifying a first data flow requirement for a first portion of said execution plan said first data flow requirement corresponding to a partitioning of a data flow required by said first portion;

identifying a second data flow requirement for a second portion of said execution plan said second data flow requirement corresponding by said second portion; and

allocating a data flow director between said first portion and said second portion when said first data flow requirement is not compatible with said second data flow requirement said data flow director repartitioning a data flow of said first portion to be compatible with said second data flow requirement.

35. (Once amended) [The method of Claim 20 further comprising the steps of:] A method for parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute database management system (DBMS) operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation is performed by dividing said second operation;

initiating an operation coordinator in a computer system to coordinate execution of said execution plan;

initiating, by said operation coordinator, a first set of slaves operating on a plurality of data partitions to produce data, the quantity of said data partitions being greater than the quantity of said first set of slave processes;

initiating, as said plurality of entities, by said operation coordinator, a second set of slaves to consume data; and

directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data.

36. (Once amended) The method of claim 35 wherein said execution plan is comprised of operator nodes and said operator nodes are linked together to form execution sets.

37. (Once amended) [The method of Claim 20 further comprising the steps of:] A method for parallelizing an operation, the method comprising the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute said operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation includes dividing said first operation;

[initiating a data flow scheduler in said computer system to coordinate data flow;]

initiating [, as said plurality of entities, by said data flow scheduler,] producer slaves operating on a plurality of data partitions to produce a first data production;

initiating [, by said data flow scheduler,] consumer slaves to consume said first data production;

[transmitting a ready message to said data flow scheduler when said producer slaves become ready to produce data;

transmitting a completion message to said data flow scheduler when said first data production is completed:]

[generating, by said data flow scheduler, in response to said completion message, an] when said first data production is completed, generating an identification of a plurality of said consumer slaves that did not receive data in said first data production [, said generating step using information derived from said ready message] ;

examining [, by said producer slaves,] said identification during a subsequent data production; and

reducing said subsequent data production such that said subsequent data production does not produce data for said plurality of said consumer slaves.

38. (Unchanged) A method for processing a query, the method comprising the steps of:

receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;

dividing the operation into a set of work partitions;

performing a determination of how many entities to use to perform said operation based, at least in part, on the degree of parallelism specified in said statement;

assigning work partitions from said set of work partitions to a plurality of entities based on said determination; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

39. (Unchanged) The method of Claim 38 wherein:

the query requires a plurality of operations; and

the statement specifies said degree of parallelism for a subset of the plurality of operations required by the query.

40. (Unchanged) The method of Claim 39 wherein the degree of parallelism specified by the query indicates that no amount of parallelism is to be used during execution of a particular portion of the query.

41. (Unchanged) The method of Claim 38 wherein the degree of parallelism specified by the query indicates a maximum amount of parallelism to use during execution of said operation.

42. (Unchanged) A method of processing a query, the method comprising the steps of:

dividing an operation required by said query into a set of work partitions by generating a set of query fragments;

incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment;

assigning query fragments from said set of query fragments to a plurality of entities; and

said plurality of entities operating in parallel on query fragments assigned to them to perform said operation, wherein entities working on a query fragment associated with a hint perform the work partition associated with said query fragment in a manner dictated by said hint.

43. (Unchanged) The method of Claim 42 wherein the step of incorporating hints includes incorporating hints that dictate the operation of a table scan.

44. (Once amended) The method of Claim 43 wherein the step of incorporating hints that dictate the operation of a table scan includes incorporating hints that [rowed] rowid partitioning is to be used during the table scan.

45. (Unchanged) The method of Claim 42 wherein the step of incorporating hints includes incorporating hints that specify performance of a full table scan.

46. (Unchanged) The method of Claim 42 wherein the step of incorporating hints includes incorporating hints that specify using a particular type of join.

47. (Unchanged) The method of Claim 46 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a sort/merge join.

48. (Unchanged) The method of Claim 46 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a nested loop join.

49. (Unchanged) A method of processing a query, the method comprising the steps of:

determining a hierarchy of operations associated with a query;

dividing a first operation required by said query into a first set of work partitions;

dividing a second operation required by said query into a second set of work partitions, wherein said second operation immediately follows said first operation in said hierarchy;

dividing a third operation required by said query into a third set of work partitions, wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

said first plurality of entities operating in parallel on work partitions assigned to them from said first set of work partitions to perform said first operation;

assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities; and

said second plurality of entities operating in parallel on work partitions assigned to them from said second set of work partitions to perform said second operation;

assigning work partitions from said third set of work partitions to said first plurality of entities; and

said first plurality of entities operating in parallel on work partitions assigned to them from said third set of work partitions to perform said third operation.

50. (Unchanged) The method of Claim 49 further comprising performing the following steps when a given entity in said first set of entities finishes performing a work partition from said first set of work partitions:

determining whether there are any unassigned work partitions from said first set of work partitions; and

if there are no unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said third set of work partitions; and

if there are unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said first set of work partitions.

1 51. (Unchanged) The method of Claim 49 wherein the hierarchy includes odd levels and
2 even levels, and the method further comprises the steps of assigning work partitions from odd
3 levels to said first plurality of entities and work partitions from even levels to said second
4 plurality of entities.

1 52. (Unchanged) The method of Claim 49 wherein performing work partitions in said first set
2 of work partitions causes said first set of entities produce output consumed by said second
3 plurality of entities, and performing work partitions in said third set of work partitions causes
4 said first set of entities to consume output produced by said second plurality of entities.

1 56. (Cancelled)

1 57. (Cancelled)

1 58. (Cancelled)

1 59. (Cancelled)

1 60. (Cancelled)

1 61. (Cancelled)

1 62. (Cancelled)

63. (Once amended) [The] A computer-readable medium [of Claim 56] carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions; wherein the step of assigning work partitions is performed by assigning the work partitions in a sequence based at least in part on sizes associated with the work partitions; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

64. (Unchanged) The computer-readable medium of Claim 63 wherein the step of assigning the work partitions in a sequence is performed by assigning relatively larger work partitions before assigning relatively smaller work partitions.

65. (Twice Amended) [The] A computer-readable medium [of Claim 58 wherein:] carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of

work partitions from said set of work partitions, wherein the step of assigning work partitions includes

assigning said at least one entity a first work partition from said set of work partitions; and

after said at least one entity has completed operating on said first work partition, assigning said at least one entity a second work partition from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

wherein the operation is specified in a query that corresponds to a hierarchy of operations; and

the step of assigning said at least one entity a second work partition includes

determining whether there are any unassigned work partitions from a first level in the hierarchy to which said first work partition belonged; and

if there are no unassigned work partitions from the first level in the hierarchy, then selecting said second work partition from a level in said hierarchy that is two levels above said first level in said hierarchy.

66. (Once amended) [The] A computer-readable medium [of Claim 56 wherein:] carrying instructions for parallelizing an operation, the instructions including instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities,

wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operation in parallel on work partitions assigned to them to perform said operation;

wherein the instructions include instructions for performing the step of generating a serial execution plan for operations in a database management system (DBMS) running on a computer system;

wherein the instructions include instructions for performing the step of generating a parallelized execution plan for said serial execution plan, said parallelized execution plan including first and second operations;

wherein the step of dividing an operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

wherein the instructions include instructions for performing the step of executing said parallelized execution plan when a plurality of parallel resources of said computer system are available; and

wherein the instructions include instructions for performing the step of executing said serial execution plan when said plurality of resources are not available.

67. (Once amended) The computer-readable medium of claim 66 wherein said step of generating a parallelized execution plan includes the steps of:

identifying one or more segments of said serial execution plan that can be parallelized; and

identifying partitioning requirements of said one or more segments.

68. (Once amended) The computer-readable medium of claim 66 wherein said step of generating a parallelized execution plan is based on a specification of parallelism in a statement specifying one of said operations.

69. (Once amended) [The] A computer-readable medium carrying instructions for parallelizing an operation, the instructions including [of Claim 56 further comprising] instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform some operation;

generating an execution plan for said operation;

examining said execution plan from bottom up;

identifying a parallelized portion of said execution plan, said parallelized portion can be processed in parallel, said parallelized portion including first and second operations, said first and second operations being executable in parallel;

wherein the step of dividing the operation is performed by dividing said second operation;

wherein the plurality of entities includes one or more slave processes operating on a plurality of data partitions, the quantity of said data partitions being greater than the quantity of said slave processes;

identifying some serial portion of said execution plan, said serial portion can be processed in serial; and

allocating a central scheduler between said parallelized portion and said serial portion.

70. (Once amended) The computer-readable medium of Claim 69 further including instructions for performing the steps of:

identifying a first data flow requirement for a first portion of said execution plan said first data flow requirement corresponding to a partitioning of a data flow required by said first portion;

identifying a second data flow requirement for a second portion of said execution plan said second data flow requirement corresponding by said second portion; and

allocating a data flow director between said first portion and said second portion when said first data flow requirement is not compatible with said second data flow requirement said data flow director repartitioning a data flow of said first portion to be compatible with said second data flow requirement.

71. (Once amended) [The] A computer-readable medium carrying instructions for parallelizing an operation, the instructions including [of Claim 56 further comprising] instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute database management system (DBMS) operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation is performed by dividing said second operation;

initiating an operation coordinator in a computer system to coordinate execution of said execution plan;

initiating, by said operation coordinator, a first set of slaves operating on a plurality of data partitions to produce data, the quantity of said data partitions being greater than the quantity of said first set of slave processes;

initiating, as said plurality of entities, by said operation coordinator, a second set of slaves to consume data; and

directing said second set of slaves to produce data and said first set of slaves to consume data when said first set of slaves finishes producing data.

72. (Once amended) The computer-readable medium of claim 71 wherein said execution plan is comprised of operator nodes and said operator nodes are linked together to form execution sets.

73. (Once amended) [The] A computer-readable medium carrying instructions for parallelizing an operation, the instructions including [of Claim 56 further comprising] instructions for performing the steps of:

dividing the operation into a set of work partitions;

assigning work partitions from said set of work partitions to a plurality of entities, wherein at least one entity of said plurality of entities is assigned a plurality of work partitions from said set of work partitions;

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation;

generating an execution plan to execute said operations in parallel, said execution plan including first and second operations;

wherein the step of dividing said operation includes dividing said first operation;

[initiating a data flow scheduler in said computer system to coordinate data flow;]

initiating [, as said plurality of entities, by said data flow scheduler,] producer slaves operating on a plurality of data partitions to produce a first data production;

initiating [, by said data flow scheduler,] consumer slaves to consume said first data production;

[transmitting a ready message to said data flow scheduler when said producer slaves become ready to produce data;]

[transmitting a completion message to said data flow scheduler when said first data production is completed:]

when said first data production is completed, generating an [generating, by said data flow scheduler, in response to said completion message, an] identification of a plurality of said consumer slaves that did not receive data in said first data production [, said generating step using information derived from said ready message];

examining [, by said producer slaves,] said identification during a subsequent data production; and

reducing said subsequent data production such that said subsequent data production does not produce data for said plurality of said consumer slaves.

74. (Unchanged) A computer-readable medium storing instructions for processing a query, the instructions including instructions for performing the steps of:

receiving a statement that specifies at least (a) an operation and (b) a degree of parallelism to use in performing the operation;

dividing the operation into a set of work partitions;

performing a determination of how many entities to use to perform said operation based, at least in part, on the degree of parallelism specified in said statement;

assigning work partitions from said set of work partitions to a plurality of entities based on said determination; and

said plurality of entities operating in parallel on work partitions assigned to them to perform said operation.

75. (Unchanged) The computer-readable medium of Claim 74 wherein:

the query requires a plurality of operations; and

the statement specifies said degree of parallelism for a subset of the plurality of operations required by the query.

76. (Unchanged) The computer-readable medium of Claim 75 wherein the degree of parallelism specified by the query indicates that no amount of parallelism is to be used during execution of a particular portion of the query.

77. (Unchanged) The computer-readable medium of Claim 74 wherein the degree of parallelism specified by the query indicates a maximum amount of parallelism to use during execution of said operation.

78. (Unchanged) A computer-readable medium carrying instructions for processing a query, the instructions including instructions for performing the steps of:

dividing an operation required by said query into a set of work partitions by generating a set of query fragments;

incorporating hints into at least some of said query fragments, wherein the hint associated with a given query fragment indicates how to perform the work partition associated with said given query fragment;

assigning query fragments from said set of query fragments to a plurality of entities; and

said plurality of entities operating in parallel on query fragments assigned to them to perform said operation, wherein entities working on a query fragment associated

with a hint perform the work partition associated with said query fragment in a manner dictated by said hint.

79. (Unchanged) The computer-readable medium of Claim 78 wherein the step of incorporating hints includes incorporating hints that dictate the operation of a table scan.

80. (Once amended) The computer-readable medium of Claim 79 wherein the step of incorporating hints that dictate the operation of a table scan includes incorporating hints that [rowed] rowid partitioning is to be used during the table scan.

81. (Unchanged) The computer-readable medium of Claim 78 wherein the step of incorporating hints includes incorporating hints that specify performance of a full table scan.

82. (Unchanged) The computer-readable medium of Claim 78 wherein the step of incorporating hints includes incorporating hints that specify using a particular type of join.

83. (Unchanged) The computer-readable medium of Claim 82 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a sort/merge join.

84. (Unchanged) The computer-readable medium of Claim 82 wherein the step of incorporating hints that specify using a particular type of join includes incorporating hints that specify using a nested loop join.

85. (Unchanged) A computer-readable medium carrying instructions for processing a query, the instructions including instructions for performing the steps of:

determining a hierarchy of operations associated with a query;

dividing a first operation required by said query into a first set of work partitions;

dividing a second operation required by said query into a second set of work partitions, wherein said second operation immediately follows said first operation in said hierarchy;

dividing a third operation required by said query into a third set of work partitions, wherein said third operation immediately follows said second operation in said hierarchy;

assigning work partitions from said first set of work partitions to a first plurality of entities;

said first plurality of entities operating in parallel on work partitions assigned to them from said first set of work partitions to perform said first operation;

assigning work partitions from said second set of work partitions to a second plurality of entities, wherein said second plurality of entities are different entities than said first plurality of entities; and

said second plurality of entities operating in parallel on work partitions assigned to them from said second set of work partitions to perform said second operation;

assigning work partitions from said third set of work partitions to said first plurality of entities; and

said first plurality of entities operating in parallel on work partitions assigned to them from said third set of work partitions to perform said third operation.

86. (Unchanged) The computer-readable medium of Claim 85 further comprising instructions for performing the following steps when a given entity in said first set of entities finishes performing a work partition from said first set of work partitions:

determining whether there are any unassigned work partitions from said first set of work partitions; and

if there are no unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said third set of work partitions; and

if there are unassigned work partitions from said first set of work partitions, then assigning the given entity a work partition selected from said first set of work partitions.

87. (Unchanged) The computer-readable medium of Claim 85 wherein the hierarchy includes odd levels and even levels, and the instructions further include instructions for performing the steps of assigning work partitions from odd levels to said first plurality of entities and work partitions from even levels to said second plurality of entities.

88. (Unchanged) The computer-readable medium of Claim 85 wherein performing work partitions in said first set of work partitions causes said first set of entities produce output consumed by said second plurality of entities, and performing work partitions in said third set of

work partitions causes said first set of entities to consume output produced by said second plurality of entities.

Acknowledgment Receipt

Mailing Date: April 10, 2001
Attorney Docket No. 50277-1646
Serial No. 09/757,399
Inventor(s): Gary Hallmark, et al.
Title: METHOD AND APPARATUS FOR IMPLEMENTING PARALLEL OPERATIONS IN A DATABASE MANAGEMENT SYSTEM

Attorney: BDH/cf
First Class Mail

DOCKETED DATES: 4/24/01

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

1) Response to Notice of Missing Parts of Application
2) Copy of Notice to File Missing Parts of Application
3) Check in the amount of $130.00
4) Preliminary Amendment
5) Postcard for Return Receipt

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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

REISSUE APPLICATION DECLARATION BY THE INVENTOR	Docket Number (Optional) 50277-1646

As a below named inventor, I hereby declare that:
My residence, mailing address and citizenship are stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is described and claimed in patent number 5,857,180 ,granted January 5, 1999 , and for which a reissue patent is sought on the invention entitled METHOD AND APPARATUS FOR IMPLEMENTING PARALLEL OPERATIONS IN A DATABASE MANAGEMENT SYSTEM
the specification of which

[ ] is attached hereto.

[X] was filed on Jan. 5, 2001 as reissue application number 09/757,399
and was amended on Jan. 5, 2001 .
(If applicable)

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.
I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.
I verily believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below. (Check all boxes that apply.)

[ ] by reason of a defective specification or drawing.

[X] by reason of the patentee claiming more or less than he had the right to claim in the patent.

[ ] by reason of other errors.

At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, such must be stated with an explanation as to the nature of the broadening:
This is a broadening reissue. The error occurred when, during the prosecution of the original patent, the claims were repeatedly amended by inserting into all of the independent claims limitations directed to additional novel features regardless of the novel features that the claims initially recited. Thus, even the broadest claims resulting from this process require a combination of several independently patentable features, even though the patentee is entitled to separate claims to each of the novel features of the invention. This reissue corrects that error. The nature of the broadening is illustrated by comparing the new Claim 20 to the issued Claim 1. The new Claim 20 requires a set of entities to perform an operation in parallel, where at least one of the entities is assigned more than one work partition from the operation ("feature A"). However, in addition to reciting feature A, the issued Claim 1 recites other novel features, such as generating a serial execution plan and a parallel execution plan for the same operation, and determining which of the two plans to execute based on the resources available at the time of execution ("feature B"). Thus, Claim 1 is partially inoperative in that it can only be used to prevent the unauthorized use of feature A when that feature is used in combination with feature B. In contrast, new Claim 20 covers feature A without also requiring feature B.

PTO/SB/51 (10-00)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(REISSUE APPLICATION DECLARATION BY THE INVENTOR, page 2)

Docket Number (Optional) 50277-1646

All errors corrected in this reissue application arose without any deceptive intention on the part of the applicant. As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the United States Patent and Trademark Office connected therewith.

Name(s) Registration Number

Correspondence Address: Direct all communications about the application to:

☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*

Type Customer Number here

☒ Firm or Individual Name	Hickman, Palermo, Truong & Becker LLP				
Address	1600 Willow Street				
Address					
City	San Jose	State	CA	Zip	95125
Country	U.S.A.				
Telephone	(408) 414-1080	Fax	(408) 414-1076		

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this declaration is directed.

Full name of sole or first inventor (given name, family name)
Gary Hallmark

Inventor's signature	Date Feb 21, 2001
Residence 11415 NW Blackhawk Dr., Portland, OR	Citizenship USA
Mailing Address 11415 NW Blackhawk Dr., Portland, OR 97229, USA	

Full name of second joint inventor (given name, family name)
Daniel Leary

Inventor's signature	Date
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Mailing Address 161 Ashburnham Road, New Ipswich, New Hampshire 03071	

Full name of third joint inventor (given name, family name)

Inventor's signature	Date
Residence	Citizenship
Mailing Address	

☐ Additional joint inventors are named on separately numbered sheets attached hereto.

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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

REISSUE APPLICATION DECLARATION BY THE INVENTOR	Docket Number (Optional) 50277-1646

As a below named inventor, I hereby declare that:
My residence, mailing address and citizenship are stated below next to my name.
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is described and claimed in patent number 5,857,180, granted January 5, 1999, and for which a reissue patent is sought on the invention entitled METHOD AND APPARATUS FOR IMPLEMENTING PARALLEL OPERATIONS IN A DATABASE MANAGEMENT SYSTEM

the specification of which

[ ] is attached hereto.

[X] was filed on Jan. 5, 2001 as reissue application number 09/757,399 and was amended on Jan. 5, 2001 (If applicable).

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.
I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.
I verily believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below. (Check all boxes that apply.)

[ ] by reason of a defective specification or drawing.

[X] by reason of the patentee claiming more or less than he had the right to claim in the patent.

[ ] by reason of other errors.

At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, such must be stated with an explanation as to the nature of the broadening:
This is a broadening reissue. The error occurred when, during the prosecution of the original patent, the claims were repeatedly amended by inserting into all of the independent claims limitations directed to additional novel features regardless of the novel features that the claims initially recited. Thus, even the broadest claims resulting from this process require a combination of several independently patentable features, even though the patentee is entitled to separate claims to each of the novel features of the invention. This reissue corrects that error. The nature of the broadening is illustrated by comparing the new Claim 20 to the issued Claim 1. The new Claim 20 requires a set of entities to perform an operation in parallel, where at least one of the entities is assigned more than one work partition from the operation ("feature A"). However, in addition to reciting feature A, the issued Claim 1 recites other novel features, such as generating a serial execution plan and a parallel execution plan for the same operation, and determining which of the two plans to execute based on the resources available at the time of execution ("feature B"). Thus, Claim 1 is partially inoperative in that it can only be used to prevent the unauthorized use of feature A when that feature is used in combination with feature B. In contrast, new Claim 20 covers feature A without also requiring feature B.

PTO/SB/51 (10-00)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(REISSUE APPLICATION DECLARATION BY THE INVENTOR, page 2)

Docket Number (Optional) 50277-1646

All errors corrected in this reissue application arose without any deceptive intention on the part of the applicant. As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the United States Patent and Trademark Office connected therewith.

Name(s) Registration Number

Correspondence Address: Direct all communications about the application to:

☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*

Type Customer Number here

☐ Firm or Individual Name	Hickman, Palermo, Truong & Becker LLP				
Address	1600 Willow Street				
Address					
City	San Jose	State	CA	Zip	95125
Country	U.S.A.				
Telephone	(408) 414-1080	Fax	(408) 414-1076		

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this declaration is directed.

Full name of sole or first inventor (given name, family name)
Gary Hallmark

Inventor's signature	Date
Residence 11415 NW Blackhawk Dr., Portland, OR	Citizenship USA
Mailing Address 11415 NW Blackhawk Dr., Portland, OR 97229, USA	

Full name of second joint inventor (given name, family name)
Daniel Leary

Inventor's signature	Date 12 MARCH 2001
Residence New Ipswich, New Hampshire	Citizenship USA
Mailing Address 161 Ashburnham Road, New Ipswich, New Hampshire 03071	

Full name of third joint inventor (given name, family name)

Inventor's signature	Date
Residence	Citizenship
Mailing Address	

☐ Additional joint inventors are named on separately numbered sheets attached hereto.

Acknowledgment Receipt

Mailing Date: January 5, 2001
Attorney Docket No. 50277-1646
Inventor(s): Gary Hallmark, et al.
Title: METHOD AND APPARATUS FOR IMPLEMENTING PARALLEL OPERATIONS IN A DATABASE MANAGEMENT SYSTEM

Attorney: BDH/cf
Express Mail No.: EL652872248US

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

1) Reissue Patent Application Transmittal
2) Reissue Application Fee Transmittal Form (in duplicate)
3) Specification and Claims (Patent no. 5,857,180)
4) Reissue Oath/Declaration (2 pages, unsigned)
5) Reissue Application: Consent of Assignee; Statement of Non-Assignment
6) Statement under 37 CFR 3.73(b)
7) Power of Attorney and Revocation of Previous Powers (2 pages)
8) Information Disclosure Statement & Form 1449 (20 references attached)
9) Preliminary Amendment
10) Postcard for Return Receipt

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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

REISSUE APPLICATION: CONSENT OF ASSIGNEE; STATEMENT OF NON-ASSIGNMENT	Docket Number (Optional) 50277-1646

This is part of the application for a reissue patent based on the original patent identified below.

Name of Patentee(s)
Gary Hallmark, Daniel Leary

Patent Number	Date Patent Issued
5,857,180	January 5, 1999

Title of Invention METHOD AND APPARATUS FOR IMPLEMENTING PARALLEL OPERATIONS IN A DATABASE MANAGEMENT SYSTEM

1. [X] Filed herein is a statement under 37 CFR 3.73(b). (Form PTO/SB/96)

2. [ ] Ownership of the patent is in the inventor(s), and no assignment of the patent is in effect.

One of boxes 1 or 2 above must be checked. If multiple assignees, complete this form for each assignee. If box 2 is checked, skip the next entry and go directly to "Name of Assignee".

The written consent of all assignees and inventors owning an undivided interest in the original patent is included in this application for reissue.

The assignee(s) owning an undivided interest in said original patent is/are Oracle Corporation, and the assignee(s) consents to the accompanying application for reissue.

Name of assignee/inventor (if not assigned)
ORACLE CORPORATION

Signature	Date
	January 4, 2001

Typed or printed name and title of person signing for assignee (if assigned)
SANJAY PRASAD
Title: Chief Patent Counsel

EXPRESS MAIL NO. EL652872248US

Attorney Docket No. 50277-1646

PTO/SB/96 (08-00)
Approved for use through 10/31/2002. OMB 0651-0031
U.S.Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: ORACLE CORPORATION

Application No./Patent No.: 5,857,180 Filed/Issue Date: January 5, 1999

Entitled: METHOD AND APPARATUS FOR IMPLEMENTING PARALLEL OPERATIONS IN A DATABASE MANAGEMENT SYSTEM

, a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency)

states that it is:

1. [X] the assignee of the entire right, title, and interest; or

2. [ ] an assignee of less than the entire right, title and interest.
The extent (by, percentage) of its ownership interest is _____%

in the patent application/patent identified above by virtue of either:

A. [X] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 6821, Frame 0013, or for which a copy thereof is attached.

OR

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

1. From:_____ To:_____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame_____, or for which a copy thereof is attached.

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3. From:_____ To:_____
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[ ] Additional documents in the chain of title are listed on a supplemental sheet.

[ ] Copies of assignments or other documents in the chain of title are attached.
[NOTE: A separate copy (*i.e.*, the original assignment document or a true copy of the original document) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

January 2001
Date

SANJAY PRASAD
Typed or printed name

Signature

CHIEF PATENT COUNSEL
Title

EXPRESS MAIL NO. EL652872248US